EXHIBIT 35

REQUEST FOR TECHNICAL SERVICE

CONFIDENTIAL

NUMBER: 67567 762701
GROUP: ZONOLITE
ACTUAL COST: $220.00
REPORTING DATE: July 11, 1976

EX 183.183

SUMMARY:

Ten samples were received from Weedsport, New York, and evaluated by standard methods. All tem samples exceeded 4.5 fibers per cc of air.

"All ten samples exceeded 4.5 fibers per cc of air."

"SIMULATED ATTIC FILL TESTS"

CONSTRUCTION PRODUCTS DIVISION

PAGE 1

REQUEST FOR TECHNICAL SERVICE

NUMBER: 67567
GROUP: Zonolite 762700
DATE: 7/11/77
CHARGE NO.: 71-046
REQUESTOR: F.W. Eaton
MARKETING or MANUFACTURING APPROVAL:
NAME: T.E. Hamilton
APPROVED: T.E. Hamilton (ip)

PROBLEM TITLE: Environmental Evaluation - Air - Fibrous Materials

SIGNIFICANCE: The evaluation of workplace air on a periodic basis is necessary to comply with the air sampling section of the OSHA Asbestos Standard.

SPECIFIC OBJECTIVE: Determine fiber counts for filter media.

SUGGESTED APPROACH: Phase contrast microscopy.

DEADLINE (Last day information will be of value): 2 weeks

DETAILS OF PROBLEM: Evaluate 10 sim. attic test samples from Weedsport

ACCEPTED BY RESEARCH DEPT.: [signature] DATE: 7

ASSIGNED TO: M. Doyle

ADDITIONAL COPIES: Original to Library, H.C.Duecker, H.A.Eschenbach, E.S.Hood, J.W.Wolter, B.R.W. CPD-TEA, File: 71-046

CONFIDENTIAL

SIMULATED ATTIC FILL TESTS
SCREENED 1/4 SY #3

GRACE

AIR SAMPLING RECORD SHEET

PLANT LOCATION: WEEDSPORT
CONTAMINANT: FIBER
SAMPLING BY: F.W. EATON
DATE: 7/6/77 - 7/7/77

SAMPLING CONDITIONS:
OUTSIDE: MID 70's SHOWERS
INSIDE DRAFT:
VISIBLE DUST:

HOUSEKEEPING:

Sample Number	Employee Name	Job Location and Description	Remarks	Pump Number	Pump Off	Pump On	Sampling Time	Flow Rate	Total Sampled Volume	Lab Evalua'
BAS2-AF1	DUKE	Poured Attic	20-yer Baker Bros	ICG-6			16	1.6		5.08
BAS2-AF2			VERY LITTLE DUST. SIMILAR TO SCREENED 1/4	ICG-7			16	1.6		4.81

PLAINTIFF'S EXHIBIT 35 MDL 1376

EXHIBIT 28 Emergency Motion

CONSTRUCTION
PRODUCTS
VISION

NUMBER: 6/201
GROUP: Zonolite 702700
DATE: 7/11/77
CHARGE NO.: 71-046
REQUESTOR: F.W. Eaton
MARKETING or MANUFACTURING APPROVAL:
NAME: T.E. Hamilton
APPROVED: T. E. Hamilton (ec)

PAGE 1

REQUEST FOR TECHNICAL SERVICE

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EXHIBIT
183.183

ACCEPTED BY RESEARCH DEPT.: [signature] DATE: 7/11/77

ASSIGNED TO: M. Doyle

ADDITIONAL COPIES: Original to Library, H.C.Duecker, H.A.Eschenbach, F.W.Eaton, R.M.Wine, E.S.Wood, J.W.Wolter, B.R.Williams, W.R.Hanlon, CPD-T&A, File: 71-046

CONFIDENTIAL

15083050 72-51

REQUEST FOR TECHNICAL SERVICE

CONFIDENTIAL

NUMBER: 67567 762701
GROUP: ZONOLITE
ACTUAL COST: $220.00
REPORTING DATE: July 11, 1976

SUMMARY:

Ten samples were received from Weedsport, New York, and evaluated by standard methods. All tem samples exceeded 4.5 fibers per cc of air.

RELEVENT PRIOR TECHNICAL SERVICE:

CONCLUSIONS:

DATA AND ANALYSIS:

See attachment.

Maureen A. Doyle

M. A. Doyle

MAD:mlr
attachment

15083051

72-52

SCREENED 2 Y 93

GRACE

AIR SAMPLING RECORD SHEET

PLANT LOCATION Weedsport

CONTAMINANT Fiber

SAMPLING BY F.W. Farm

DATE: 7/7/77

SAMPLING CONDITIONS:

OUTSIDE

INSIDE DRAFT

VISIBLE DUST

HOUSEKEEPING:

Sample Number	Employee Name	Job Location and Description	Remarks	Pump Number	Pump Off	Pump On	Sampling Time	Flow Rate	Total Sampled Volume	Lab Evaluation
ASB-1	F3 Dune	Bagging Attic	Remaining 10 Bags on				8	1.6		11.22
ASB-2	F4		Test No. 10ASB				8	1.6		10.15
			Note: Main Bagging [illegible]	[illegible]						
			That Test 18ASGE'S Not as							
			Clean as 18AS2E4. Could	Possibly						
			Ram into Different [illegible]	[illegible]						
			As Furnace [illegible] [illegible]	To [illegible]						
			Heat Around Test 18AS[illegible]	[illegible]						
			If This is a Fact it	Should						
			Show up in [illegible] [illegible]	[illegible]						
			Tests 18AS-[illegible] [illegible]	[illegible]	3/[illegible]					

Additional Comments:

Laboratory Evaluation By: Maureen A. [illegible]

Date: 7/8/77

CONFIDENTIAL

76270

15083052

57

SIMULATED NI - ALL TESTS
SCREENED L. SY #3

(1)

GRACE

AIR SAMPLING RECORD SHEET

PLANT LOCATION WEEDSPORT
CONTAMINANT FIBER
SAMPLING BY F. W. EATON
DATE: 7/6/77 - 7/8/77

SAMPLING CONDITIONS:
OUTSIDE MID 70's SHOWERS
INSIDE DRAFT
VISIBLE DUST

HOUSEKEEPING:

mple mber	Employee Name	Job Location and Description	Remarks	Pump Number	Pump Off	Pump On	Sampling Time	Flow Rate	Total Sampled Volume	Lab Evalua
MS2-AF1	DUKE	POURING ATTIC	20-4CF FIBER BAGS	ICG-6			16	1.6		5.08
MS2-AF2			VERY LITTLE DUST. SHOVELED TO SCREENED L.Y.	ICG-7			16	1.6		4.81
MS4-AF1			SAME AS IBAS2				17	1.6		4.78
MS4-AF2							17	1.6		3.30
MT										
MS6-AF1			SAME AS IBAS2 EXCEPT				18	1.6		9.50
MS6-AF2			NOT AS CLEAN				18	1.6		6.17
BAS8-AF1			10-4CF FIBER BAGS.				8	1.6		11.22
BAS8-AF2			REMAINING BAGS (16) SAMPLED				8	1.6		12.83
15083053			ON IBAS8-AF1 BAG 2							

Additional Comments: (1) ALL CYCLONE FILTERS REMOVED
(2) SCREENED OVER 14 MESH SCREEN
(3) CG-6 RIGHT SHOULDER ICG-7 LEFT.

Laboratory Evaluation By: Marion A. Eyb...
Date: 7/11/77

CONFIDENTIAL

762703

EXHIBIT 36

00931330

Construction Products Division

GRACE

Industrial Chemicals Group
W.R. Grace & Co
62 Whittemore Avenue
Cambridge, Mass. 02140

(617) 876-1400

April 1, 1980

Mr. Dale Ray
Consumer Product Safety Commission
Economic Program Analysis Division
Room 656-B
Washington, D.C. 20207

Dear Mr. Ray:

This will confirm our conference call of March 12, 1980 in which we reviewed with you the results of testing performed by the Construction Products Division of W. R. Grace & Co to determine the extent of asbestiform tremolite fiber release associated with use of Grace vermiculite in consumer products. During our conversation, you requested that we set out the details of Grace's fiber exposure test methodology and test results and indicate the nature of Grace's fiber reduction efforts.

As you know, tremolite is a tramp mineral contaminant which is associated with vermiculite and which Grace has been attempting to reduce to the maximum extent feasible. Since 1970, Grace has invested over $15 million to extract worthless materials and contaminants and to reduce airborne fiber exposure in its vermiculite mining, milling and expanding operations. A substantial part of this investment was associated with the construction by Grace of a new vermiculite mill at its Libby, Montana mine which uses wet screening and other wet ore beneficiation processes designed to reduce the asbestiform tremolite contaminant associated with vermiculite.

Following startup of the new mill, in early 1975, Grace took further steps to reduce tremolite contamination by removing and disposing of selected fines which have a higher level of contamination, thereby reducing the level of contamination in its finished ore concentrate. Since that time, changes have been made in the exfoliation process equipment used at Grace's vermiculite expanding plants which

process Grace vermiculite ore for use in both consumer and industrial products. These changes provided for further screening, separation, and removal of both fines and the heavier unexpanded residual high density material following exfoliation both of which may contain a higher level of asbestiform tremolite contamination than the finished product. By use of bag houses and other dust filtration equipment, including an air elutriation step, additional reduction of the tremolite fiber contamination of expanded vermiculite end product is accomplished.

Grace has taken the further step of developing a binding agent for its Zonolite(R) Attic Insulation product and has recently started up equipment at all its expanding plants to apply this binder to Attic Insulation to further reduce dust and exposure to asbestiform fibers during the use of this product.

As a result of these reductions in asbestiform tremolite contamination, we believe that consumer products containing vermiculite and sold by Grace do not generate unreasonable risks for users. This has been verified by Grace's fiber exposure tests of consumer products containing expanded Grace vermiculite ore. All measurements were made by the NIOSH-approved technique as set forth in 40 CFR Section 1910.1001, paragraphs (e) and (f), utilizing the membrane filter method at 400-450 X (magnification) (4 millimeter objective) with phase contrast illumination. The results of these tests were as follows:

Product	Fibers Detected
Terra-Lite(R) Vermiculite	None Detected
Redi-Earth(R)	None Detected
Lightweight Fertilizer (Scott's Turf Builder)	None Detected
Zonolite Attic Insulation	Some fibers detected during installation

The actual test protocols and results of the tests are shown in Annex A to this letter. No tests were performed on Pool Cushion (R), a Grace product, which is used for protection of the base of vinyl-lined above-ground swimming pools since this use occurs out-of-doors and, typically, involves no more than 3 to 12 bags of vermiculite, depending on the size of the pool.

The only Grace product whose use resulted in a detectable fiber exposure was Attic Insulation and, then, at low levels only during installation. Tests indicate no residual fiber release following installation. Since this product is unlikely to be used more than two or three times during an entire lifetime and, then, only for exposure times which would not be expected to exceed two hours in any one case, the lifetime dosage is several orders of magnitude lower than any promulgated government standard applicable to tremolite fiber exposure.

Grace is continuing to exert its best efforts to further reduce the asbestiform tremolite contamination associated with its vermiculite products to the maximum extent feasible. For example, beginning in May of this year, a new rock and tremolite removal circuit should be operational at the Libby mill. This circuit is expected to reduce the level of tremolite contamination in fine size vermiculite ore by 50%. Additional research is underway to develop a similar circuit for reduction of tremolite contamination in the coarser sizes of vermiculite ore used for Zonolite Attic Insulation. One promising separation technique is slot screening which, if successful, could reduce tremolite contamination in the coarse ore concentrate by over 50%.

We are rapidly approaching a point of diminishing return since the amount of asbestiform tremolite contaminant in the vermiculite ore presently shipped to the exfoliating plants averages only 0.5% on a dry weight basis. For expanded vermiculite products, the level of contaminant is on average at or below the lowest level of reliable detectability, 0.2% on a dry weight basis. Accordingly, the 50% reduction Grace expects to achieve in the fine ores by May and, ultimately, the coarse ore sizes is a reduction from an already very low contaminant level. With this background, it is clear to us that the task of further reducing the remaining residual contamination in unexpanded ore and expanded vermiculite products will show a rapidly escalating cost in relation to the benefits derived.

We trust that this information will be useful to you in connection with the CPSC's evaluation of the asbestos contamination issue.

Very truly yours,

E. S. Wood
Executive Vice President

Attachment

cc/ David C. Evans, Esq.

bcc/ B. A. Blessington
F. W. Eaton
R. M. Vining
C. E. Brookes
A. A. Eustis
C. N. Graf
O. M. Favorito

ANNEX A

USER EXPOSURE TO FIBROUS TREMOLITE IN VERMICULITE CONSUMER PRODUCTS

TEST DATA

I. TEST PROTOCOL

A. Horticultural Products

1. Consumer Use of Terra-Lite(R) Vermiculite[a]

(a) Mix and fill pots to simulate consumer preparation of a mix of 50% peat moss and 50% Terra-Lite vermiculite by scooping equal volumes of materials out of separate packages and depositing on work surface. Hand mix to reasonable uniformity and fill fifteen (15) 4" diameter flower pots in 15 minutes. Press down to firm up the soil to hold the plant.

After 8 days the 15 pots were brought into the work area where three separate procedures were performed. Fiber counts were taken during each of these three procedures. Five pots were used for each of the three procedures.

(b) Knock Out and Disposal-- To simulate the consumer who does not intend to reuse the soil. Invert the pot and rap on the working surface so that the soil drops out. Brush the mound of soil off the bench into a disposal container. Take a paper towel and wipe inside of pot so that is is clean for reuse and dispose of the paper towel. In this procedure, contents of five pots will be disposed of during the 15 minute test period.

(c) Knock Out and Reuse for Potting Other Plants - Simulate a consumer who will reuse the potting soil. Rap pot on workbench by hand and break up the lump of soil to

make it similar to its original free-flowing condition. Repeat this five times. Combine all soil into one pile; then proceed to refill pots by scooping the material back in and tamping it down. In this 15 minute test procedure, five pots will be filled.

(d) Knock Out and Blend with New Potting Soil - Simulate a consumer who will blend old with new potting soil. Rap pot on workbench by hand and break up the lump of soil to make it similar to its original free-flowing condition. Repeat procedure five times. Obtain additional potting soil to match the volume of the dried soil. Place new soil on top of the old soil and mix together by hand. Use this mix to fill pots. During this 15 minute test procedure, 10 pots are filled.

2. Consumer Use of Redi-Earth(R) Potting Soil[b]

(a) Same procedure as 1 (a) except substitute premixed Redi-earth for Terra-Lite Vermiculite as the soil medium.

(b) Same procedure as 1 (b).

(c) Same procedure as 1 (c).

(d) Same procedure as 1 (d).

B. Consumer Use of Lightweight Fertilizer[c]

1. General

A five building apartment complex was selected as the test site. With over 100,000 sq. ft. of grass area, the site allowed air sampling while fertilizing over an extended period of time.

The tests were conducted with two people: one filling the spreader hopper and fertilizing, and the other maintaining log sheets, time and pump calibrations.

2. Application of Lightweight Lawn Fertilizer

Two sampling pumps with filter cassettes located in the left and right breathing zones were worn by the applicator during the sampling/fertilizing period. The applicator filled the spreader hopper to within 2" of the top and refilled when the hopper was approximately 3/4ths empty. Using a new Model 35 Scotts spreader with guide markers, the applicator spread thirteen (13) bags of lawn fertilizer at the normal coverage application rate (5000 ft^2/bag).

C. Consumer Installation of Vermiculite Attic Insulation[d]

1. General

Vermiculite Attic Insulation is generally purchased in quantities of 10 - 100 bags per home to "retrofit" or "add to" existing insulation in an existing home. Seldom is vermiculite Attic Insulation installed in new construction. To determine consumer exposure to tremolite fibers, the following series of tests by home owners was intended to indicate actual exposures under a variety of conditions.

2. Area Engineering Samples

Engineering samples were taken as follows:

(a) Prior to installing vermiculite Attic Insulation, monitor attic space for 5 - 6 hours.

(b) Approximately two months after installing insulation, monitor attic space for 5 - 6 hours.

3. Pouring/Leveling Vermiculite Attic Insulation in a Home

Each test home utilized 40 - 70 bags (3 cubic feet each) of vermiculite Attic Insulation. The installer was monitored during the placement of insulation.

Initially, place 15 - 20 bags in the attic. The installer poured all bags and leveled insulation with a wooden hand screed or one with a handle to push insulation back into roof eaves. Additional bags were brought to the attic in lots of 15 - 20 bags as required.

NOTES:

(a) Terra-Lite vermiculite is composed of expanded #3 vermiculite ore from either Libby, Montana or Enoree, South Carolina.

(b) Redi-Earth is a potting soil consisting of a mixture of 50% peat moss and 50% expanded #3 vermiculite ore from either Libby, Montana or Enoree, South Carolina with plant nutrients added.

(c) Lightweight fertilizer utilizes expanded #4 vermiculite ore from either Libby, Montana or Enoree, South Carolina.

(d) Attic Insulation is composed of expanded #1 or #2 vermiculite ore available only from Libby, Montana.

(e) Pool Cushion which was not tested utilizes expanded #3 vermiculite ore from either Libby, Montana or Enoree, South Carolina.

II. RESULTS (See note 1)

	PERSONNEL AVE. EXPOSURE (f/cc)		PERSONNEL TWA EXPOSURE (f/cc)	
	South Carolina	Montana	South Carolina	Montana
A. HORTICULTURAL PRODUCTS (see Note 2)				
1. Consumer Use of Terra-Lite Vermiculite				
(a) Mix and Fill Pots	<0.29	<0.14	<0.073	<0.035
(b) Knock Out and Disposal	<0.14	<0.14	<0.035	<0.035
(c) Knock Out and Reuse	<0.14	<0.14	<0.035	<0.035
(d) Knock Out and Blend	<0.14	<0.14	<0.035	<0.035
2 Consumer Use of Redi-Earth				
(a) Mix and Fill Pots	<0.29	<0.14	<0.073	<0.035
(b) Knock Out and Disposal	<0.14	<0.14	<0.035	<0.035
(c) Knock Out and Reuse	<0.14	<0.14	<0.035	<0.035
(d) Knock Out and Blend	<0.14	<0.14	<0.035	<0.035
B. LIGHTWEIGHT FERTILIZER				
1. Application of Lightweight Fertilizer With Montana derived vermiculite		<0.03		<0.008

C. Home Installation of Vermiculite Attic Insulation

1. Engineering/Area Samples

Home	Type Home	No. Bags	Fiber Concentration (f/cc) Attic Before	After (see note 3)
F	Colonial	55	0.03 (see note 4)	<0.01
N	Cape	30	NO TEST	<0.01
S	Ranch	64	<0.01	<0.01
W	Colonial	70	<0.01	<0.01

03631339

2. Installer Personnel Samples

Home	Type Home	Personnel Exposure (f/cc) Ave	TWA (see note 5)
F	Colonial	2.597	0.649
N	Cape	0.971	0.243
S	Ranch	2.115	0.529
W	Colonial	1.746	0.436

NOTES:

1. The symbol < (less than) indicates no fibers were observed in the counted fields. As a measure of test precision, results are reported to be less than the value represented by one fiber if such had been detected in one of the observed fields.

According to NIOSH reports, the limit of reliable detectaility for this test procedure is 0.5 f/cc exposure and 0.1 f/cc TWA. Values below 0.5 f/cc exposure and 0.1 f/cc TWA are not judged as detectable.

2. Each test of horitcultural products was repeated using products made from both Libby, Montana ore and Enoree, South Carolina ore. The Grace vermiculite ore used in making Attic Insulation originates from the Libby, Montana mine as does the ore purchased by O. M. Scott & Sons for use in its lightweight lawn fertilizer.

3. In addition to results tabulated, two additional tests indicate no fibers detected in attics insulated with vermiculite loose fill in one case six hours and in another case approximately nine years after installation.

4. In all home attics tested, vermiculite Attic Insulation was added as a retrofit insulation over existing glass, mineral wool or cellulose insulation. In home "F", a fiber was observed in the counted fields prior to pouring vermiculite Attic Insulation. Although length and aspect ratio fell within the fiber definition, it is believed to be airborne glass fiber from existing insulation. There was no vermiculite Attic Insulation in the attic when this prejob sample was taken.

15103494

5. In calculating the time-weighted average (TWA) exposure for consumers using Attic Insulation, it is assumed that the user would work in the attic pouring Attic Insulation for two hours in one eight-hour work day. Results in C. 1., indicate no further exposures after installation. The lifetime exposure and risk associated with the use of Attic Insulation is infinitesimally small compared to industrial exposures since the opportunity for exposure is rare (perhaps twice in a lifetime) compared to a permitted industrial exposure up to 2 f/cc during each eight-hour work day throughout a working lifetime. Therefore, comparison of TWAs between a rare and nonroutine exposure in the case of Attic Insulation and the OSHA industrial standard of 2 f/cc vastly overstates the potential hazard involved in the use of Attic Insulation.

EXHIBIT 37

PERSONAL & CONFIDENTIAL

GRACE

Construction Products Division
06175361

To: W. F. McCord/Ajax

Date: March 25, 1980

From: F. W. Eaton

Subject: Consumer Products

cc: D. M. Favorito
R. M. Viring
F. S. Wood

In my recent facility survey reports on St. Thomas and Ajax, comments were made concerning end user exposure to Tremolite Fibers and CPD's response to EPA and CPSC ANPR's. D. M. Favorito has discussed this issue with you and has agreed the accompanying attachments should be forwarded to you as general information. These attachments are:

1. User Fiber Exposure - Actual attic installations
2. User Fiber Exposure - Simulated attic, L-1 unscreeded, unbound
3. User Fiber Exposure - Simulated attic, L-1 screened (14 mesh) unbound
4. User Fiber Exposure - Simulated attic, L-1 screened (14 mesh) bound w/0.5% CMC @ 0.28 qts/cf
5. CPD's response to EPA and CPSC ANPR's respecting asbestos in consumer products.
6. Consumer products fiber exposure - test protocol and results.

Test data has documented that there is no user exposure to asbestos fiber (tremolite) in mixed horticultural products or light weight fertilizer containing Libby Vermiculite (O. M. Scott Turf Builder). CPD does have concern with attic insulation as shown in the test results. In CPD's response to EPA and CPSC ANPR's we have stressed and will continue to stress to CPD's advantage, two points on the final CPSC banning of consumer patching compounds and artificial emberizing materials. These are:

1. The ban applies only to intentionally - added respirable freeform asbestos and does not apply to products having unavoidable trace amounts (contaminates).

2. In the case of contaminantes, manufacturers must take steps to reduce asbestos to the maximum extent feasible.

In point # 1, asbestos (tremolite) in vermiculite is a contaminant and not intentionally added. In point # 2 CPD has and will continue to reduce to the maximum extent feasible by:

1. New Libby mill
2. New Rock rejection circuit at Libby - in process
3. Slot screening at Libby - Research and Development stage.

PLAINTIFF'S EXHIBIT 91560

PLAINTIFF'S EXHIBIT 37 MDL 1376

EXHIBIT 30

CPD does have concern with [redacted] as shown in the test results

LEGAL & CONFIDENTIAL

GRACE

Construction Products Division
C6175361

To: W. F. McCord/Ajax

Date: March 25, 1980

From: F. W. Eaton

Subject: Consumer Products

cc: O. M. Favorito
R. M. Viring
E. S. Wood

In my recent facility survey reports on St. Thomas and Ajax, comments were made concerning end user exposure to Tremolite Fibers and CPD's response to EPA and CPSC ANPR's. O. M. Favorito has discussed this issue with you and has agreed the accompanying attachments should be forwarded to you as general information. These attachments are:

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2. User Fiber Exposure - Simulated attic, L-1 unscreeded, unbound
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4. User Fiber Exposure - Simulated attic, L-1 screened (14 mesh) bound w/0.5% CMC @ 0.28 qts/cf
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1. New Libby mill
2. New Rock rejection circuit at Libby - in process
3. Slot screening at Libby - Research and Development stage.

PLAINTIFF'S EXHIBIT 91560

4. Screen all consumer, industrial and horticultural expanded products.
5. Bind all L-1 & 2 attic insulation.

CG175382

Reduced rock content in concentrate, proper stoner adjustment and product screening to reduce unexpandable/heavy particles are the major contributors to reduced user fiber exposure to tremolite fibers. Binding of attic insulation shows some further fiber reduction but its biggest asset is to act as a dust suppressant. Process Engineering and Research are continuing binder efforts but I see little light at the end of this tunnel during the next 12 months.

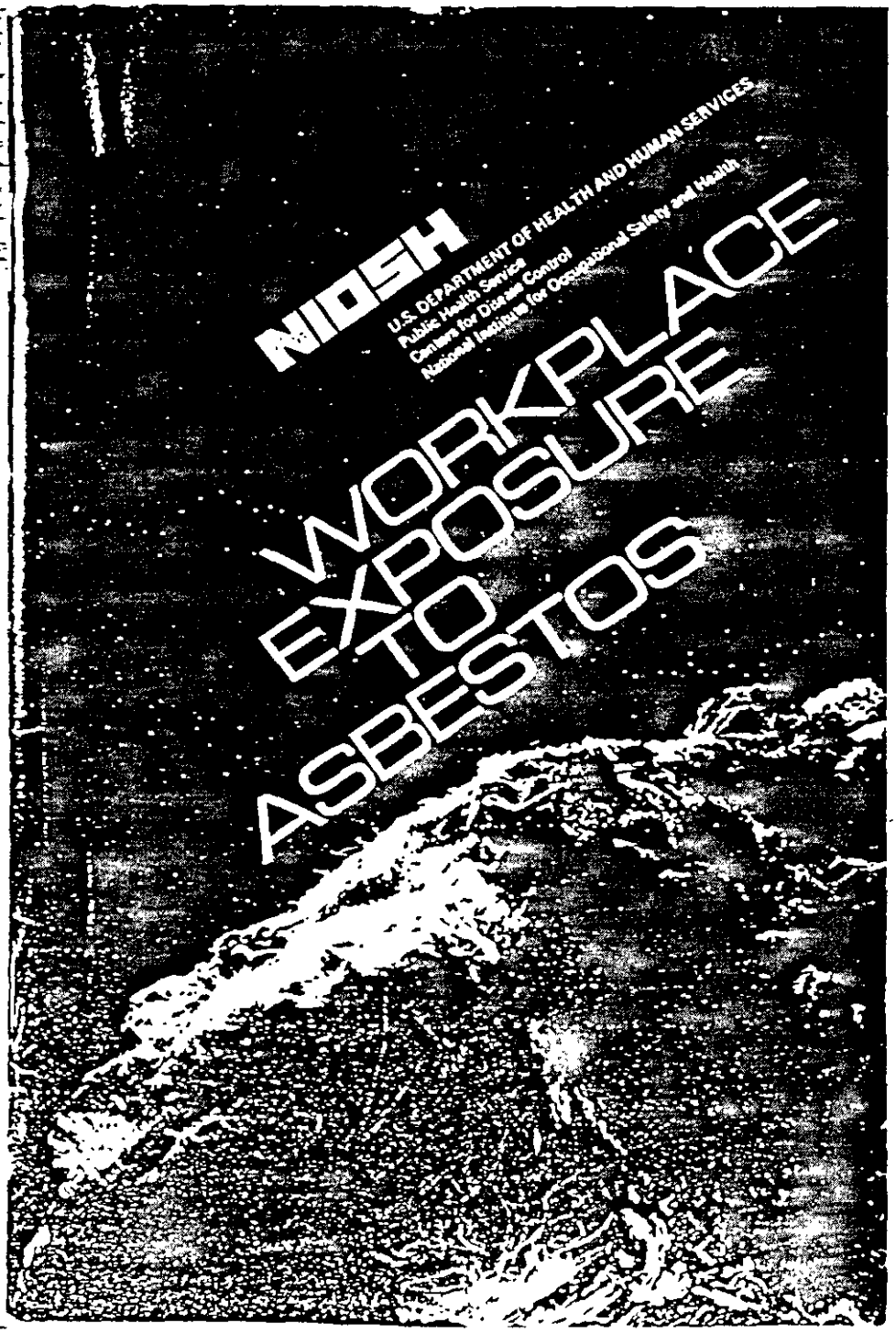
If I can provide you with any additional test data such as Monokote, masonry fill etc., please advise.

F. W. Eaton

FWE/gm
Enclosures

bcc: Bill Sinacore/W. Chicago

EXHIBIT 38



WORKPLACE EXPOSURE TO ASBESTOS
Review and Recommendations

DHHS (NIOSH) Publication No. 81-103

NIOSH-OSHA
Asbestos Work Group
April 1980

U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES
Public Health Service
Centers for Disease Control
National Institute for Occupational Safety and Health

U.S. DEPARTMENT OF LABOR
Occupational Safety and Health Administration

November 1980

For sale by the Superintendent of Documents, U.S. Government Printing Office, Washington D.C. 20402

Available data show that the lower the exposure, the lower the risk of developing asbestosis and cancer. Excessive cancer risks, however, have been demonstrated at all fiber concentrations studied to date. Evaluation of all available human data provides no evidence for a threshold or for a "safe" level of asbestos exposure. Accordingly, the committee recommends that, to the extent uses of asbestos cannot be eliminated or less toxic materials substituted for asbestos, worker exposures to asbestos must be controlled to the maximum extent possible.

4. Inadequacy of Current 2,000,000-Fiber Occupational Standard. The committee concluded that a variety of factors demonstrates that the current 2,000,000-fiber standard is grossly inadequate to protect American workers from asbestos-related disease. First, the 2,000,000-fiber standard was designed in 1969 by the British Occupational Hygiene Society (BOHS) for the limited purpose of minimizing asbestosis. Disease prevalence data from the BOHS study population collected subsequent to 1969 strongly suggest that this standard is insufficient to prevent a large incidence of asbestosis. Second, all levels of asbestos exposure studied to date have demonstrated asbestos-related disease, and a linear relationship appears to best describe the shape of the dose-response curve. These considerations led the committee to conclude that there is no level of exposure below which clinical effects do not occur. Third, the absence of a threshold is further indicated by the dramatic evidence of asbestos-related disease in members of asbestos-worker households and in persons living near asbestos-contaminated areas. These household and community contacts involved low level and/or intermittent casual exposure to asbestos. Studies of duration of exposure suggest that even at very short exposure periods (1 day to 3 months) significant disease can occur.

Although various models can be and have been fashioned to postulate possible dose-response relationships involving asbestos, the committee believes that the limited current data preclude the creation of any one empirical curve to describe *the exact* dose-response relationship. Over the last three decades, measurement techniques for asbestos have changed in several crucial respects, and there have been no suitable methods available to date to compare the results of prior techniques to current methods.

EXHIBIT 39

United States Environmental Protection Agency
Office of Toxic Substances Washington, D.C. 20460
C00090 March 1979
Toxic Substances

EPA Asbestos Containing Materials in School Buildings: Part 1

A Guidance Document

Asbestos-Containing Materials in School Buildings:

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Part 1

March 16, 1979

Dear School Officials:

Until recently exposure to asbestos was generally considered an occupational health hazard for asbestos workers. However, now we have learned of an equally serious exposure problem that can occur in all types of buildings in which certain asbestos-containing materials have been used for fireproofing, insulation, and decoration. Asbestos can be released from these materia and contaminate the building environment. Individuals w are then exposed to the asbestos could develop lung canc or cancers of other parts of the body. Unfortunately, detection of asbestos-related diseases is difficult sinc the latency period between exposure and appearance of th disease is sometimes as many as 20 to 40 years.

Since these materials are found in school buildings, we EPA are particularly concerned with the exposure of scho children. EPA has worked with the States to develop a program that responds to the need for accurate informati and guidance to deal with this difficult problem. The enclosed manuals are a major part of this program and ar being mailed to all public school districts. They were prepared to inform you of the health hazards associated with asbestos and outline the steps you and the schools your district can take to identify asbestos-containing materials and to protect students and school personnel from exposure.

Also participating in this EPA program are the Department of Health, Education, and Welfare, the Occupational Safet and Health Administration, and the Consumer Product Safet Commission. Through the Regional Offices located in majc cities across the country, EPA and these Agencies will provide assistance for the difficulties that you may encounter in undertaking a control program in your schools. We are operating several toll-free numbers that you can call to ask for information and assistance. A videotape that was prepared to supplement this manual wil also be available for your use.

A survey form is included in this manual. The form asks questions on the results of the control programs you conduct in your schools. Your participation in this part of the EPA program would be appreciated. By completing the form you will assist us in assessing the extent of th asbestos-containing material problem in the United States

I encourage you and your staff to review the enclosed manuals and inform the schools in your district of the EP program. A successful nationwide school asbestos progran depends on your efforts and those of school officials across the country. We look forward to working with you in the important weeks and months ahead.

Sincerely,

Steven D. Jellinek
Assistant Administrator
for Toxic Substances

Chapter 1: Introduction: The Concern

Exposure to asbestos was initially associated with a chronic and debilitating lung disease called asbestosis. More recently exposure to asbestos has been associated with lung cancer, a rare cancer of the chest and abdominal lining called mesothelioma, and cancers of the esophagus, stomach, colon, and other organs. Asbestos also acts as a potent cancer-causing agent in combination with cigarette smoking. In all asbestos-related diseases there is a latency or induction period of many years between initial exposure and appearance of the disease.

In most cases asbestosis has followed long exposure to high levels of asbestos fibers. Therefore, asbestosis is not as significant a concern in schools as cancer risk The potential for increasing cancer risk may exist at much lower and shorter exposures than those for asbestosis.

Under certain conditions, exposure to fibers released from asbestos-containing materials in buildings can reach levels considered potentially hazardous. Some asbestos levels measured in school buildings have even been shown to briefly exceed the current Federal workplace exposure level standards.

Why is there so much concern now?

EPA is concerned in view of the increasing knowledge of the potential of asbestos as a cancer-inducing agent at low-level exposures and the asbestos contamination that has been found in some schools. Another very important concern is that cigarette smoking can enhance the disease potential of asbestos exposure.

Is there a safe level of exposure?

EPA and the scientific community believe that any exposure to asbestos involves some health risk. No safe level of exposure (or threshold exposure level) has been established. Further, it is impossible at this time to confidently estimate the exact degree of risk associated with low-level exposures.

What is considered the best or safest approach to asbestos exposure?

Where possible all exposure to asbestos should be eliminated or controlled.

Are there special concerns about asbestos in schools?

The school children population differs from other non-occupational populations in age, population density, and behavior.

The exposure of children and adolescents to asbestos in the school building occurs early in their life span. Their remaining life expectancy provides a long development period for asbestos-related diseases.

A large number of students can be exposed at one time to asbestos that is released from asbestos-containing materials present in the school building. The duration of exposure is of concern since school children attend school daily for most of the year.

The school population is very active. Certain asbestos-containing materials can be damaged during school activities and as a result of the capricious behavior of students. When the material is damaged, asbestos fibers are released and exposure can occur. Many cases of badly damaged asbestos-containing materials have been found in schools.

Are there any Federal laws or regulations that protect school children from asbestos exposure in school buildings?

There are currently no Federal laws or regulations that protect children in school buildings where asbestos-containing materials are already present.

Is a medical examination necessary for persons exposed to asbestos in school buildings?

Medical examinations are not recommended in school exposure situations. It is difficult to detect asbestos-related diseases in children due to the long induction period before the disease appears. Individuals who have been exposed to asbestos should avoid smoking; and, of course, medical advice should be obtained for any specific concerns or symptoms.

EXHIBIT 40

Wednesday
September 17, 1980

Part VI

Environmental Protection Agency

Friable Asbestos-Containing Materials in Schools; Proposed Identification and Notification

EXHIBIT
5010(5)

(C) the benefits of such substance or mixture for various uses and the availability of substitutes for such uses, and

(D) the reasonably ascertainable economic consequences of the rule, after consideration of the effect on the national economy, small business, technological innovation, the environment, and public health.

B. Identification and Notification

EPA proposes this Identification and Notification Rule under the authority of section 6(a)(3) of TSCA, which provides that EPA may impose on a chemical substance or mixture that presents an unreasonable risk:

A requirement that such substance or mixture be marked with or accompanied by clear and adequate warnings and instructions with respect to its use, distribution in commerce, or disposal or with respect to any combination of such activities. The form and content of such warning and instructions shall be prescribed by the Administrator.

Thus section 6(a)(3) explicitly authorizes EPA to require school officials to provide warnings to school employees of the location of asbestos and instructions on how to reduce exposures. The section implicitly authorizes EPA to require those officials to inspect for and identify friable asbestos-containing materials in school buildings to determine whether the schools are subject to the warning and instruction requirements.

The interpretation that section 6(a)(3) provides this implicit authority is essential if EPA is to implement the Congressional policy found in section 2 of TSCA that "adequate authority should exist to regulate chemical substances and mixtures which present an unreasonable risk of injury to health or the environment." A warning requirement under 6(a)(3) will reduce risk to the extent that persons exposed to the chemical, once warned, will either avoid using the chemical or take precautions to avoid unnecessary exposure. But a warning requirement will not reduce risks if those to whom the requirement applies are not obligated to determine whether they are actually subject to the requirement.

III. Findings

This section presents the proposed findings which the Administrator must make in order to regulate friable asbestos-containing materials under section 6(a) of TSCA.

A. Findings Required by Section 6(c)

This part presents the statement required by section 6(c) of TSCA.

1. *Health effects of and magnitude of exposure to asbestos*

a. *Health effects.* This part summarizes EPA'S proposed findings on the health effects of asbestos. A detailed discussion of these findings is in the health effects section of the Technical Support Document.

The adverse health effects of asbestos exposure are serious. The primary evidence for these adverse health effects comes from numerous epidemiologic studies which have shown that inhalation of asbestos by humans increases risks of developing asbestosis, pleural and peritoneal mesothelioma (cancers of the linings of the thoracic and abdominal cavities), and cancers of the lung, larynx, oral cavity, esophagus, stomach, colon, and kidney. The epidemiologic evidence is supplemented by studies showing similar effects among laboratory animals.

The diseases caused by asbestos inhalation are irreversible. Asbestosis is a disease for which there is no effective treatment and which can lead to death. Pleural and peritoneal mesothelioma are virtually always fatal. Treatment of lung cancer is usually unsuccessful. The other types of cancers, amenable to medical treatment to varying degrees, may also lead to premature death.

There is a long induction or latency period for development of diseases resulting from asbestos exposure. Asbestosis and asbestos related cancers may not appear until 15 to 40 years after first exposure.

While exposure to asbestos alone produces a significant increase in the risk of lung cancer, epidemiologic research has shown that the combined effects of cigarette smoking and asbestos exposure produce a marked increase in the risk of lung cancer that is greater than the sum of the increases independently produced by the two agents.

Even after inhalation of asbestos has ceased, individuals continue to be exposed over their lifetimes to asbestos fibers. Not all inhaled fibers will reach or lodge in the lungs. Some fibers will be trapped in the nose before reaching the lungs and will be either swallowed or expectorated; other fibers are cleared after reaching the lungs and, similarly, swallowed or expectorated. Fibers up to 200 microns in length may penetrate to the lung alveoli. Many of these fibers will remain in the lungs for years and some will never be cleared. Fibers which are swallowed may eventually penetrate the gastrointestinal tract and be distributed throughout the body to tissues such as those in the brain and reproductive organs.

The epidemiologic data document injuries to health which have occurred at long and short-term occupational exposures. The epidemiologic studies have for the most part considered asbestos miners and millers, workers in asbestos-processing industries, and asbestos insulation workers. Exposures among these populations were generally long-term and at high airborne concentrations. Occupational exposures as brief as three months, however, have been shown to increase the risk of lung cancer and mesothelioma. One group of asbestos factory workers with less than three months of occupational exposure had a fourfold increase in lung cancer risk. Many of these studies also show a positive dose-response relationship; that is, higher exposures, whether measured in terms of duration or intensity or both, resulted in greater risks of disease.

There are also direct demonstrations of adverse health effects from nonoccupational asbestos exposure. Persons who merely lived in the same household as asbestos workers have developed pleural mesothelioma and signs of asbestosis. Persons living near asbestos mining areas, asbestos products factories, or shipyards have developed pleural mesothelioma.

b. *Magnitude of exposure in schools.* Airborne concentrations of asbestos in school buildings which have friable asbestos-containing materials ar frequently higher than asbestos concentrations in the ambient air. The specific airborne concentration in a given building at a given time depends on such factors as the condition and accessibility of the friable material, the amount of activity, and cleaning methods used in the building.

The prevailing concentration of asbestos (the concentration of asbestos present most of the time in occupied, active areas) in buildings which have exposed friable asbestos-containing materials is estimated to be between 58 nanograms per cubic meter (ng/m ^{3}) and 270 ng/m ^{3}, and may be as high as 500 ng/m ^{3}. For comparison, the airborne concentration of asbestos in urban ambient air is usually below 10 ng/m ^{3}.

"Peak" exposures can occur much in excess of the prevailing concentration of asbestos in buildings. These peaks will occur during damage, repair, renovation, or cleaning when the friable asbestos-containing material is conducted or settled asbestos fibers are resuspended. Airborne concentrations as high as 17 fibers per cubic centimeter (f/cc) (equivalent to 567,00 ng/m ^{3}) have been measured during removal of a small section of ceiling covered with friable asbestos-containing material, and simple maintenance and cleaning chores can lead to concentrations between 0.2 f/cc and 15 f/cc (8,600 to 500,000 ng/m ^{3}).

The cumulative exposure incurred by someone using a building with friable asbestos-containing materials will be

rule on a school for which a specific set of actions is required. If a school contains friable materials, it will incur osts for inspection ($21), sampling $40), analysis ($129 for 3 samples analyzed by PLM), recordkeeping ($25), and notification of employees ($12.50 or $42.50, depending on whether the material contains asbestos. The average total cost for such a school is therefore $227.50 or $257.50.

However, for the majority of the schools the costs will be much less. If a school has no friable material, it need only inspect ($21), record the results of the inspection ($10), and notify its employees ($12.50) for a total average cost of about $43.50. A school which has previously been inspected and which contains no friable materials will incur a cost of only $22.50 for recordkeeping and notification.

b. *Total cost of compliance.* This section contains EPA's estimates of the number of schools which will be affected by each of the rquirements of the rule; the total cost of compliance is summarized in the following table.

This estimate of the total cost of compliance does not account for the financial assistance that the Department of Education will provide to local educational agencies through the Asbestos Hazard Detection Program. ecause this program will pay for up to)% of the costs of complying with this egulation, EPA estimates that the actual total economic impact on local educational agencies may be significantly less than estimated here.

Table II.—*Compliance Costs*

Action	Unit cost	Schools affected	Total cost (in thousands)
Inspection	$21 00	44 000	$924
Sampling	25 00	5 600	140
Analysis	129 00	5,600	722
Recordkeeping			
For schools with friable material	25 00	14,000	350
For schools without friable material	10 00	86,000	860
Notification			
For schools with asbestos	42 50	10,300	438
For schools without asbestos	12 50	89,700	1,246
Recordkeeping (for school districts and private school organizations)	20 00	19 000	380
Total			5,160

There are approximately 91,000 public and 19,000 private elementary and secondary schools in the country. The 91,000 public schools are organized into about 16,000 school districts.

Many schools have already been spected (and where necessary, have mpled and analyzed) in response to State programs or to EPA's Technical Assistance Program. These schools will not have to repeat inspections, sampling, and analyses in order to comply with this rule. The number of public and private schools which remain to be inspected is approximately 44,000. This estimate may vary because inspections or sampling and analyses have in some cases been incorrectly carried out.

EPA's estimate that 44,000 public and private schools remain to be inspected is based on analysis of information obtained from State asbestos coordinators and from several well-documented State and local government reports. This information comes mainly from eleven States; of the 30,093 public schools in these States, 17,878 have been inspected. 40% of the public schools in these States have not been inspected. Assuming that this percentage is indicative of that of the nation as a whole, 36,400 public schools in the nation remain to be inspected. EPA does not have extensive data on private schools, but estimates that a similar ratio holds for private schools and public ones. Therefore, 40% of the private schools in the country, or 7,600 private schools, are estimated to require inspection.

Thus, a total of 44,000 public and private schools throughout the country will be affected by the inspection requirements. The total cost for compliance with these requirements will be $44,000 \times \$21 = \$924,000$.

EPA estimates that 5,600 public and private schools will be affected by the sampling and analysis requirements of the rule. Based on information obtained from its survey of public schools and State and local government reports, EPA estimates that 11,600 public schools have friable materials. Assuming that a similar percentage (12.7%) of private schools have friable materials, EPA calculates that 2,400 private schools (12.7% of 19,000) have such materials. The total number of public and private schools with friable materials is therefore 14,000.

However, 60% of these schools have already been inspected and the materials in them sampled and analyzed. If 40% of all schools have not already been inspected, sampled and analyzed, 5,600 schools still require sampling and analysis of friable materials. The cost of sampling and analyzing the friable materials found in these schools will be $5,600 \times (\$25 + \$129) = \$862,400$.

All 110,000 public and private schools will be affected by recordkeeping requirements. However, the majority of schools will not contain friable materials and will incur only the lesser recordkeeping costs. EPA estimates that 14,000 schools will find friable materials and will therefore spend $25 each for recordkeeping; the remaining 96,000 do not have friable materials and will require only $10 each for recordkeeping. Thus the total cost for all schools to comply with the recordkeeping requirements of this regulation will be about $(14,000 \times \$25) + (96,000 \times \$10) = \$1,310,000$.

Similarly, all schools will be affected by the requirement that employees be notified of the presence or absence of asbestos in their buildings, but the majority will incur only the lesser notification costs. EPA estimates that 100,000 schools will be found not to have asbestos-containing materials and will therefore need to spend only $12.50 each to notify their employees. The other 10,000 schools which do have asbestos-containing materials will incur costs of $42.50 each, making the total cost for all 110,000 public and private schools to notify their employees $(10,000 \times \$42.50) + (100,000 \times \$12.50 = \$1,684,000$.

All 16,000 public school districts and about 3,000 private school organizations must also compile a record. The cost of preparing and maintaining 19,000 records is estimated to be $380,000.

5. Other EPA Statutes

Section 6(c) of TSCA also requires that if the Administrator determines that a risk of injury to health or the environment could be eliminated or reduced to a sufficient extent by actions taken under another Federal law administered by EPA, the Agency may not promulgate a rule under section 6(a) of TSCA to protect against the risk unless the Administrator finds it is in the public interest to use TSCA. EPA has found no other Agency administered statute that will enable it to eliminate or reduce the risks against which this rule protects.

B. Findings Required by Section 6(a)—
(1) Unreasonable Risk

On the basis of the foregoing factual information and on the information in the rulemaking record, EPA has concluded that the presence of unidentified friable asbestos-containing materials in schools and the absence of notice of their presence and of instructions on reducing exposure constitute an unreasonable risk of injury to school children and school employees.

The presence of unidentified friable asbestos-containing materials in school buildings increases significantly the likelihood that peak exposures to asbestos will occur. Since peak exposures to asbestos in schools entail

risks of serious injuries which may be reduced at extremely low costs. EPA finds that these exposures present an unreasonable risk and should be reduced accordingly.

Peaks will occur during distrubances of the friable material (either accidental or during repair or renovation operations) and during resuspension of previously released fibers by cleaning and maintenance operations (sweeping, dusting, vacuuming, etc.), or by general activities in the vicinity of fibers that have settled on floors and other surfaces.

The 10,300 schools which EPA estimates contain friable asbestos-containing material employ over twenty thousand custodians and other maintenance personnel. These custodians will sweep in areas containing friable asbestos. They will clean and dust in these areas; they will change lights in ceilings covered with friable asbestos-containing materials; they will undertake minor repairs and renovations. Without knowing that these areas contain asbestos, these custodians will undertake normal maintenance activities with no protection against unnecessary exposures, and they will risk serious injuries as a result.

Moreover, all of these activities which cause peak exposures further contaminate the building and increase the prevailing concentrations. Sweeping, dusting, and cleaning suspend previously released fibers and disperse them throughout the building. Minor repairs and distrubances to the friable asbestos-containing materials release additional fibers. Both types of activities will increase prevalent concentrations which, in turn, will increase the risk to the larger population of children, teachers, and school administrators who occupy the buildings.

Estimates based on the linear dose-response model and the numerous documented case histories of serious injuries resulting from brief short-term exposure provide ample evidence that these peak exposures that are occurring in schools present risks of serious injuries.

EPA finds that the requirements of this proposed regulation will reduce these risks. EPA believes that school officials and maintenance personnel, once informed of the risks of asbestos and of interim measures to avoid the risks, will act in their own best interests and the interests of school children to reduce the peak exposures as much as possible. If friable asbestos-containing materials in schools are identified, custodians will be able to avoid them during renovation projects and minimize the disruptions of them during routine maintenance. If the custodians are provided with information on the use of wetting agents and on proper work practices when conducting necessary repairs and renovations, they will be able to reduce fiber release during such operations and reduce risks to themselves and to others. Instructions on proper cleaning activities in contaminated areas, including wet mopping and wet dusting, will reduce risks caused by unnecessary resuspension of asbestos fibers that would otherwise occur.

Finally, once local school officials know of the presence of friable asbestos-containing materials in buildings, they can take steps to ensure that occupants of the building avoid areas which contain the materials or avoid activities which unnecessarily disturb the materials.

Thus, by identifying the friable asbestos-containing materials in school buildings and by implementing specific interim control procedures for reducing exposures, local school officials will reduce the risks of injury resulting from such exposures to school children, custodians, and other building occupants.

In addition to reducing peak exposures, the requirements of the regulation will reduce the prevalent level of fiber concentrations in schools by reducing the number of fibers contributed to this level by repeated distrubances and resuspension. However, EPA does not regard this reduction in prevalent exposures as sufficient to protect the health of children and other building occupants over the long term. Identifying friable asbestos-containing materials in school buildings is the first step in an overall two-stage asbestos abatement program for schools. EPA intends to proceed with the part of the program, which will provide for certain abatement actions, in late 1980. This first regulation will enable school officials to complete the necessary initial steps in the program in preparation for this abatement rule and will, in the interim, reduce certain risks that would otherwise occur.

As reviewed above, the economic impacts of the rule will be small. This regulation will impose costs upon all schools, but to varying degrees, as explained in the "Economic Effects" section above. In some instances, costs to individual schools may reach several hundred dollars. These costs are not unreasonable in view of the reduction in exposure to asbestos that will result from this rule. The identification of asbestos in schools, furthermore, is a prerequisite to making the ultimate abatement determinations and will, therefore, contribute to the reduction in risk that will result from abatement.

C. Analysis Under Section 9 of TSCA

Section 9(a) of TSCA requires EPA to review other Federal authorities to determine whether action under those authorities may prevent or sufficiently reduce unreasonable risks. EPA has reviewed other Federal authorities and finds that action under those authorities will not sufficiently reduce the risks addressed by this rule. Specifically, EPA has considered the regulatory authority of the Consumer Product Safety Commission (CPSC), the Occupational Safety and Health Administration (OSHA), and the Department of Education (ED).

Friable asbestos-containing materials in schools may be "consumer products" within the meaning of section 3 of the Consumer Product Safety Act (CPSA), 15 U.S.C. 2051. Section 12 and 15 of the CPSA provide authority under which the Commission might require asbestos inspection, identification or marking requirements.[8] Neither section is sufficient to prevent or reduce the risk of asbestos-containing materials in schools primarily because implementation of the section cannot be undertaken without identification of the specific manufacturers, distributors or retailers of the asbestos products for which regulation is sought. Section 12, 15 U.S.C. 2061, authorizes the Commission to file, in a United States District Court, an action against identified manufacturers, distributors, or retailers of an "imminently hazardous consumer product" for such relief as may be necessary to protect the public against the hazard.

Similarly, section 15 of the CPSA, 15 U.S.C. 2064, authorizes the Commission to order identified manufacturers, distributors or retailers of any product that presents a "substantial product hazard" to provide notice of the hazard to the general public or to persons to whom the manufacturer, distributor or retailer knows the product was delivered or sold.[9] Friable asbestos-containing materials were installed in over 10,000 schools between 1954 and 1973. It would be prohibitively difficult to determine which companies installed, sold, or purchased those asbestos materials. Often there are no installation

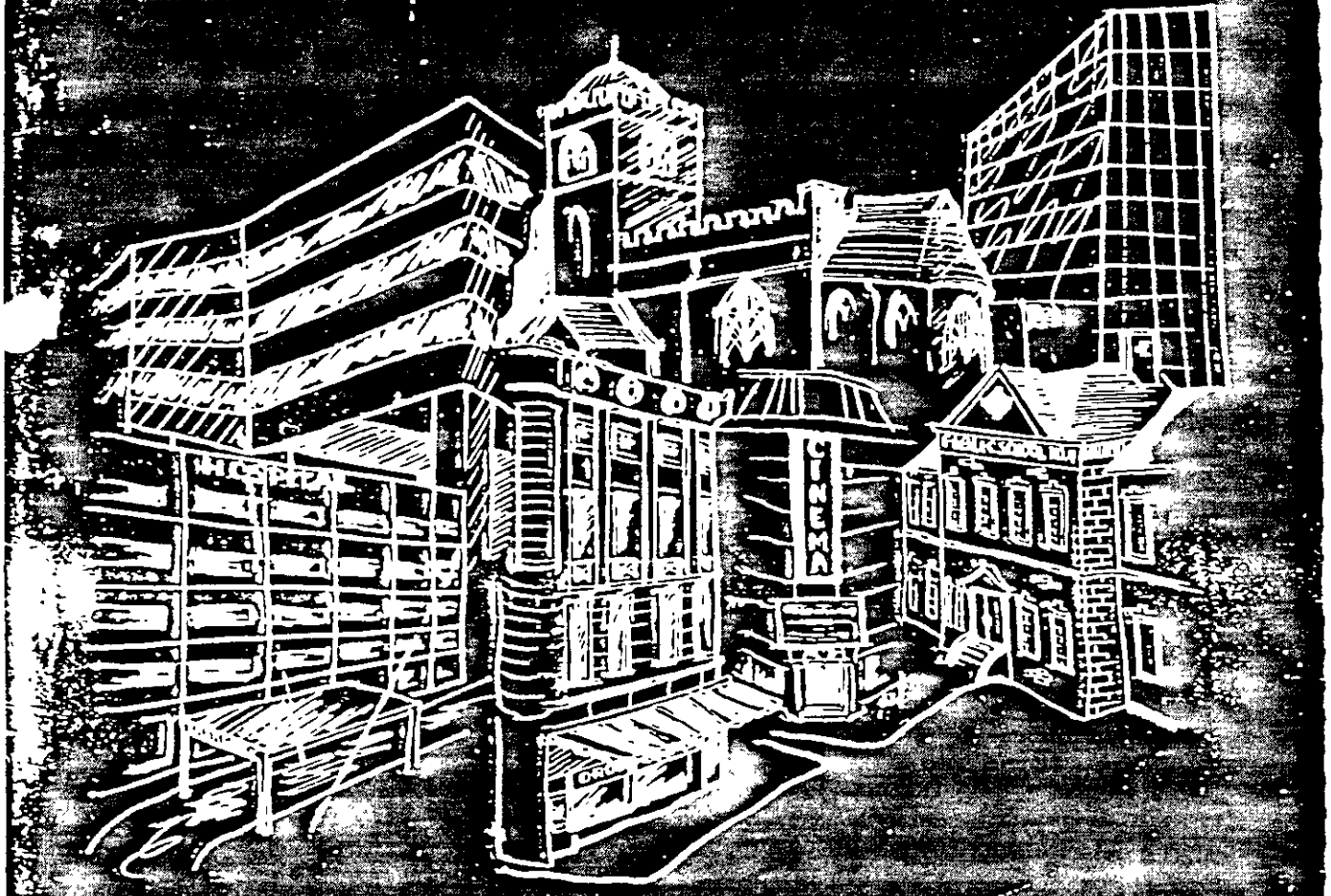
[8] Section 8 of the CPSA, 15 U.S.C. 2057, authorizes the Commission to issue rules to ban hazardous consumer products. Rules under Section 8, however, may only apply to consumer products manufactured after the effective date of the rule. In this rule EPA is concerned with existing asbestos products.

[9] In analyzing sections 12 and 15 of the CPSA, the EPA assumes that asbestos in schools meets the tests of either "imminently hazardous consumer product" or substantial product hazard."

EXHIBIT 41

EPA

Guidance for Controlling Friable Asbestos-Containing Materials in Buildings



EPA Report Number 560/5-83-002
March 1983

GUIDANCE FOR CONTROLLING FRIABLE ASBESTOS-CONTAINING MATERIALS IN BUILDINGS

Field Studies Branch
Design and Development Branch
Exposure Evaluation Division
Office of Toxic Substances
Office of Pesticides and Toxic Substances
U.S. Environmental Protection Agency
Washington, D.C. 20460

CHAPTER 1 — EXPOSURE TO ASBESTOS INSIDE BUILDINGS

The Environmental Protection Agency (EPA) has been concerned with the disease-causing potential of nonindustrial exposure to asbestos since the early 1970s. The concern derives from epidemiologic evidence linking airborne asbestos exposures by asbestos workers to various types of cancer and nonmalignant respiratory diseases, and from recognition that large quantities of asbestos have been found in building materials, insulation, and other products used in schools and other buildings. This chapter (1) summarizes information on the relationship between health effects and exposure to airborne asbestos; (2) describes federal regulations affecting asbestos emissions, the use of asbestos materials, and worker exposure levels; and (3) compares levels of airborne asbestos in buildings with those in asbestos workplace settings and outdoors. The purpose of the chapter is to place in perspective asbestos exposure levels and health risks likely to be experienced by occupants of buildings with asbestos-containing materials. The basic exposure-risk issues are summarized below.

Safe Level of Exposure: EPA and the scientific community believe that any level of exposure to asbestos involves some health risk, although the exact degree of risk cannot be reliably estimated. The risk of cancer is of greater concern at low exposure levels than the risk of asbestosis.

Special Concerns: Children and young adults who are exposed to asbestos have a greater chance than older people of developing certain asbestos-related diseases due to a longer remaining lifespan during which disease may develop. Also, smokers exposed to asbestos are at greater risk than nonsmokers with a similar level of exposure.

Federal Regulations Affecting Asbestos in Buildings: Current regulations restrict the use of asbestos in new buildings, specify work practices during removal of asbestos-containing materials from existing buildings, and require the identification of asbestos in schools. No exposure standards have been set for nonindustrial settings, and no regulations mandate corrective actions in buildings where asbestos-containing materials are found.

Relative Exposure Levels in Buildings: Prevalent levels of airborne asbestos inside buildings where asbestos-containing materials are present may exceed outdoor levels by a factor of 100. However, these indoor levels are lower by a factor of at least 1,000 than historic asbestos workplace levels where the occurrence of asbestos-related disease is well documented. When asbestos-containing materials are damaged, peak levels inside buildings may approach historic workplace levels.

Need for Action: The level of airborne asbestos in buildings with asbestos-containing materials represents a potential for exposure and risk of asbestos-related disease that cannot be ignored. The decision whether or not to take action and the selection among different courses of action are responsibilities of individual building owners.

1.1 Health Effects Related to Asbestos Exposure

Exposure to high levels of airborne asbestos is associated with a debilitating lung disease called asbestosis; a rare cancer of the chest and abdominal lining called mesothelioma; and cancers of the lung, esophagus, stomach, colon, and other organs. The relationship between exposure level and health risk is complex. The best available data on asbestos worker exposure indicate that the risks of asbestosis, lung cancer, and mesothelioma decrease in direct proportion to a decrease in total asbestos exposure (the average airborne asbestos

EXHIBIT 42

United States
Environmental Protection
Agency

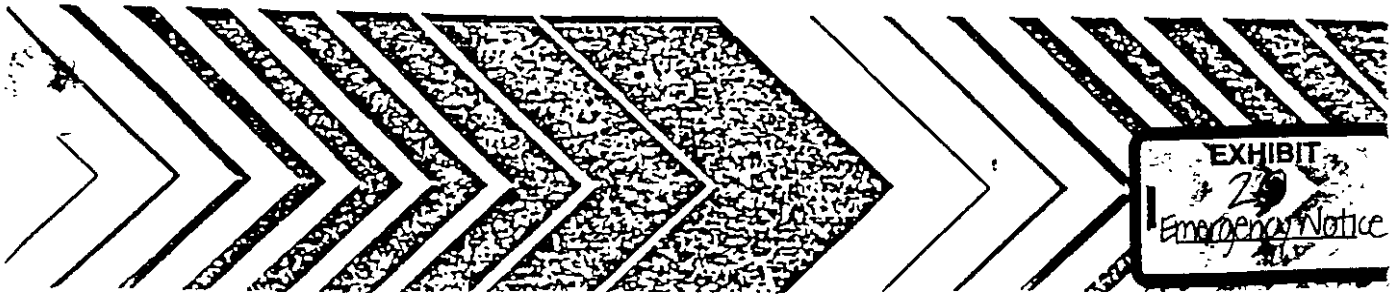
Office of Health and
Environmental Assessment
Washington, DC 20460

EPA/600/8-84/003F
June 1986

Research and Development

EPA

Airborne Asbestos Health Assessment Update



EPA/600/8-84/003F
June 1986

Airborne Asbestos Health Assessment Update

Environmental Criteria and Assessment Office
Office of Health and Environmental Assessment
Office of Research and Development
U.S. Environmental Protection Agency
Research Triangle Park, N.C. 27711

TABLE 3-23. SUMMARY OF AVERAGE ASBESTOS AIR CONCENTRATION DURING INSULATION WORK[a] (Selikoff et al., 1979)

Research group	Average fiber concentration, f/ml	
	Light and heavy construction	Marine work
Nicholson (1975)	6.3	
Cooper and Balzer (1973)	2.7	6.6
Ferris et al. (1971)		2.9
Harries (1971)		8.9
Average concentrations of all visible fibers counted with a konimeter and bright-field microscope.		
Murphy et al. (1971)		8.0
Fleischer et al. (1946)		30-40
Estimates of past exposure based on current membrane-filter data.		
Nicholson (1976a)	10-15	

[a]Average concentrations of fibers longer than 5 μm evaluated by membrane filter techniques and phase-contrast microscopy.

Source: Nicholson (1976a).

different laboratories in the United States found that the average fiber concentration of asbestos dust in insulation work, between 1968 and 1971, ranged from about 3 to 6 f/ml. A similar study in the Devonport Naval Dockyard in Great Britain, with the same techniques, obtained 8.9 f/ml for the average of long-term sampling of asbestos concentrations measured during application of insulating materials aboard ship (Harries, 1971). In the research that led to these data, it was reported that peak exposures could be extremely high. It was not uncommon, for example, to get 2- to 5-minute concentrations of asbestos exceeding 100 f/ml during the mixing of cement. This mixing, however, would only be done perhaps once an hour, so that exposures measured during that hour, including the mixing, would seldom average more than 10 f/ml. Similar experiences were subsequently reported by Cooper and Miedema (1973), who stated, "Peak concentrations may be high for brief periods, while time-weighted averages are often deceptively low."

EXHIBIT 43

ZONOLITE

pounded. When insulation decomposes, absorbs moisture, becomes infested with vermin, or loses its insulating efficiency after it is installed it may have to be removed and replaced. That means cleaning out all the old insulation, putting in new insulation, and repairing the walls or ceilings. It means a lot of trouble and expense.

The only way to be sure that this will not happen to you is to select an insulation of proved permanence. Select Zonolite Insulation. Through rigorous testing and extensive usage over many years, Zonolite has proved that it fulfills completely all of the following requirements for good insulation. No other known material can equal such a record.

1. Dual Insulation Value . . . *Insulates both by its air cell construction and its glittering, reflective surfaces.*
2. *Uniform Tamper-Proof Density* . . . Same density as when in the home as when it leaves the factory.
3. Complete Fill . . . Fills walls solidly leaving no voids. Does not "ball-up" on rough obstructions, nails, wires, or pipes. Cannot be "flushed up."
4. Light in Weight . . . A bag can be handled easily. A 2-inch layer of Zonolite adds only 1½ pounds per square foot of ceiling.
5. Easy to Install . . . No need for mask, gloves, or special equipment. It pours easily and cleanly. The average home can be insulated in just a few hours.
6. Chemically Inert . . . Contains no harmful chemicals. Will not disintegrate nor deteriorate. Will not corrode any material. Will not stain wall or plaster. Is practically moisture-proof.
7. Fire-proof . . . Not merely are "resistant." It melts at over 2400° Fahrenheit.
8. Vermin-proof . . . Mice, rats, insect larvae, or termites will not attack it.
9. Rot-proof . . . Will not decompose nor give off odors. It is a 100% mineral material
10. Naturally Permanent . . . The permanence of Zonolite is not dependent upon synthetic treatments. Its inherent properties make it the most effective insulation for your home forever.

Permanent as the Earth Itself

PLAINTIFF'S EXHIBIT 43

EXHIBIT 31 Emergency Notice

ZONOLITE

IF YOU ARE BUILDING A HOME, don't take chances with just "insulation." Be sure of permanent, efficient performance. Select Zonolite, the material that fulfills all the requirements for good insulation.

If your present home is not insulated, don't shiver through another winter nor swelter through another summer. Let your present wasted fuel dollars pay for a complete Zonolite installation . . . now!

Why not talk to your lumber dealer today? He'll be glad to tell you all about it.

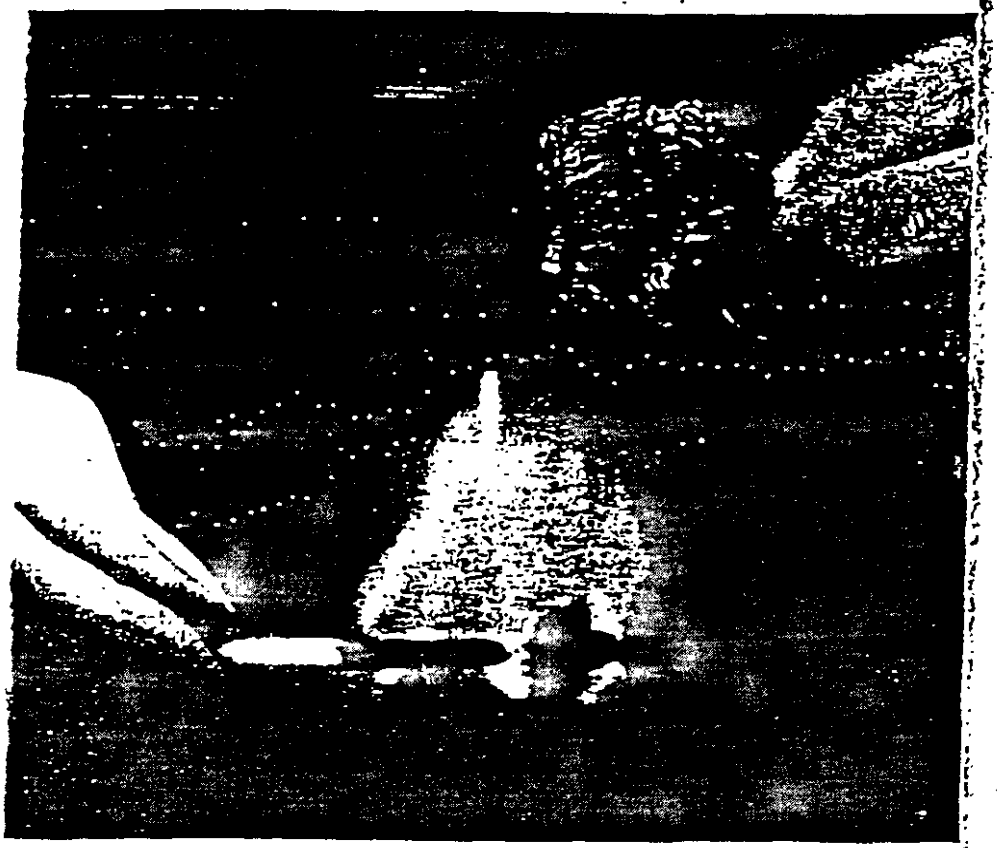
Permanent as the Earth Itself

"No need for mask ...It pours...cleanly.

. . . Contains no harmful chemicals."

ZONOLITE

THE MODERN MIRACLE OF INSULATION



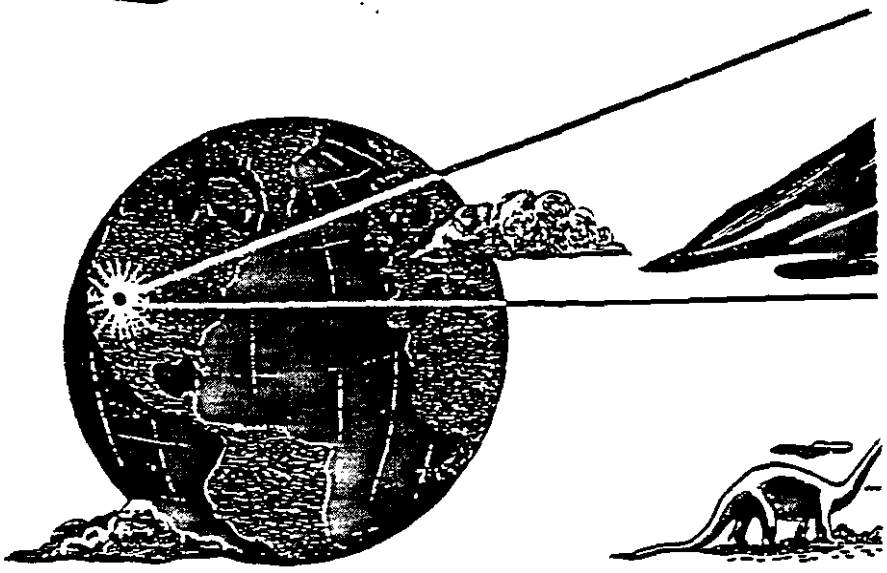
Permanent as the Earth Itself

ZONOLITE

REMEMBER THE STORY of how roast pork was discovered? Back in Ancient China, according to the legend, some fellow's pig pen burned to the ground, and all his pigs with it. After the fire he accidentally stuck his finger into one of the simmering animals. Jamming the smarting finger into his mouth, he was delighted with the taste he found there. That gave him an idea. He spread the word, and soon his neighbors for miles around were burning down their pig pens.

And so roast pork was discovered!

Just a few years ago a discovery equally important was made in much the same way. A group of engineers were seeking mineral deposits in the mountains near Libby, Montana. One day one of the men



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accidentally heated what looked like ordinary mica. To his amazement the ore expanded to several times its original size and changed its color as he watched.

Although these engineers didn't know it, on that day they discovered Zonolite—a material which now is used in a thousand ways the world over. Today Zonolite is known as "The Modern Miracle of Insulation."

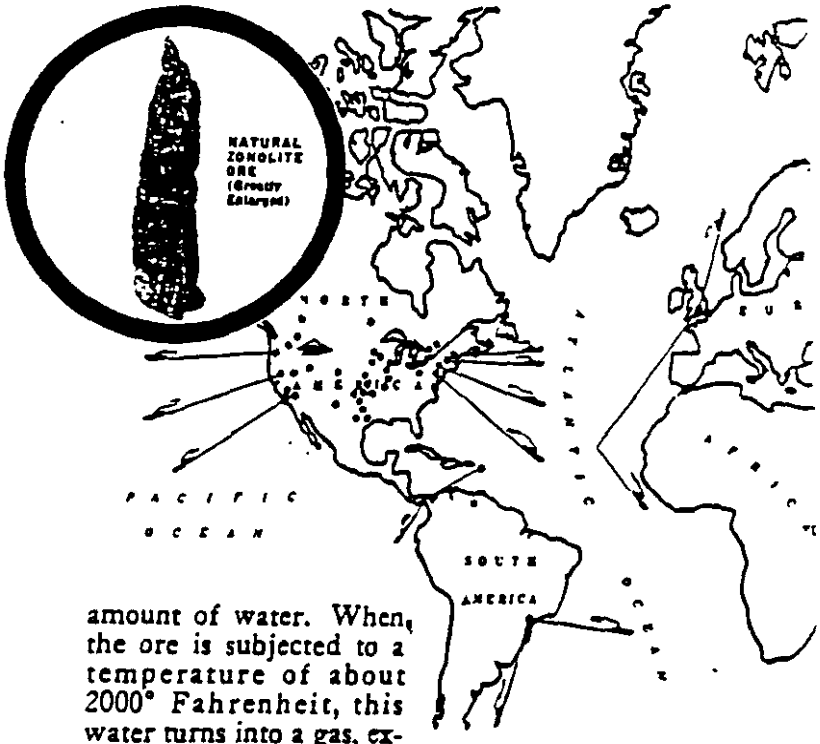
For six hundred million years the mica-like ore from which Zonolite is made has lain on Mount Zonolite completely unprotected, perfect prey for the destructive forces of time and weather. Rain has drenched it; winter cold has chilled it; forest fires have raged around it; summer sun has blazed down upon it; yet it has stood all these tests without deterioration.

Who knows what prehistoric monsters wandered over Mount Zonolite, how many battles were fought or how many generations of trees grew and died in that spot before a curious engineer accidentally discovered the secret of Zonolite?

In the romantic story of Zonolite there is a clear cut, unimpeachable record of natural permanence that no other insulation has been able to equal.

the Earth itself

THE METHOD OF CONVERTING the micaceous ore that is dug from the earth at Mount Zonolite into the lightweight, air-filled granular substance that is Zonolite Insulation has changed very little from the first. It is a process of heating, nothing more. Each flake of ore consists of about one million laminations per inch. Trapped between each layer there is a minute



amount of water. When the ore is subjected to a temperature of about 2000° Fahrenheit, this water turns into a gas, explodes the ore and expands it twelve to fifteen times its original size, producing countless tiny dead air spaces in each granule. In the exploding process the color of the ore changes to a glittering golden brown giving the expanded granules of insulation bright, shiny surfaces which have high heat reflectivity. This reflective quality plus the dead air cell entrapment makes Zonolite the only material having a dual insulating value. It insulates efficiently from sub-zero to 2000° F.

Permanent as

LIFE

If the engineers who discovered Zonolite could have looked just twenty years into the future they would have seen ore from Mount Zonolite travelling by land and water to Burma, India, Australia, Malaya, England, Canada and South America. They would have seen a vast network of more than fifty Zonolite manufacturing plants, thirteen of them in foreign countries. They would have seen thousands of homes, office buildings, and factories made comfortable—warmer in winter, cooler in summer—by Zonolite Granular Fill Insulation. They would have seen Zonolite Insulating Bricks protecting the walls of gigantic furnaces, Zonolite in the walls of great cold storage plants, Zonolite All-Purpose Plaster providing better walls for countless buildings, Zonolite Lightweight Concrete on the roofs of some of the largest buildings in the world. They would have thrilled to see how rapidly new uses are being found for that simple ore that waited six hundred million years to reveal its great secret.

Earth Itself

ZONOLITE

INSULATION IS NOW ACCEPTED as an essential part of every building. Home owners, as well as architects and builders, know that it is false economy to try to get along without it. In a recent nationwide survey the respondents were asked to rank in the order of importance to them the reasons why they might insulate their homes. More people gave "because insulation makes homes warmer in winter," than any other reason. Close behind were "because it lowers fuel bills," and "because it makes homes cooler in the summer." Insulation will do all these things. An efficient insulation will pay for itself in actual fuel savings within one to three years.

There are several materials on the market today which, if properly installed, will do an efficient job of insulating for a time. In choosing an insulation it is extremely important to investigate two things:

1. *"Does this insulation automatically assume the correct insulating density when it is installed?"*
2. *"Will it stay forever at maximum efficiency without settlement, rot or disintegration?"*

The efficiency of Zonolite is not dependent upon the chance that it may be installed at the correct density. It cannot be stretched too thin nor compressed too tight. You know what you are getting with Zonolite. The long life of Zonolite is not dependent upon fancy treatments. It is 100% mineral and naturally permanent. You get lasting, uniform insulation with Zonolite.

Don't make the mistake of buying just "insulation." Insulation is a sound investment in comfort, health, money; but poor insulation is a bad investment com-

Permanent as

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pounded. When insulation decomposes, absorbs moisture, becomes infested with vermin, or loses its insulating efficiency after it is installed, it may have to be removed and replaced. That means cleaning out all the old insulation, putting in new insulation, and repairing the walls or ceilings. It means a lot of trouble and expense.

The only way to be sure that this will not happen to you is to select an insulation of proved permanence. Select Zonolite Insulation. Through rigorous testing and extensive usage over many years, Zonolite has proved that it fulfills completely all of the following requirements for good insulation. No other known material can equal such a record.

1. **Dual Insulation Value** . . . Insulates both by its air cell construction and its glittering, reflective surfaces.
2. **Uniform Tamper-Proof Density** . . . Same density installed in the home as when it leaves the factory.
3. **Complete Fill** . . . Fills walls solidly leaving no voids. Does not "ball-up" on rough obstructions, nails, wires, or pipes. Cannot be "fluffed up."
4. **Light in Weight** . . . A bag can be handled easily. A 3-inch layer of Zonolite adds only 1½ pounds per square foot of ceiling.
5. **Easy to Install** . . . No need for mask, gloves, or special equipment. It pours easily and cleanly. The average home can be insulated in just a few hours.
6. **Chemically Inert** . . . Contains no harmful chemicals. Will not disintegrate nor deteriorate. Will not corrode any material. Will not stain wall or plaster. Is practically moisture-proof.
7. **Fire-proof** . . . Not merely fire "resistant." It melts at about 2400° Fahrenheit.
8. **Vermin-proof** . . . Mice, rats, insect larvae, or termites will not attack it.
9. **Rot-proof** . . . Will not decompose nor give off odors. It is a 100% mineral material.
10. **Naturally Permanent** . . . The permanence of Zonolite is not dependent upon synthetic treatments. Its inherent permanence means efficient insulation for your home forever.

Martha Steele

ZONOLITE

IF YOU ARE BUILDING A HOME, don't take chances with just "insulation." Be sure of permanent, efficient performance. Select Zonolite, the material that fulfills all the requirements for good insulation.

If your present home is not insulated, don't shiver through another winter nor swelter through another summer. Let your present wasted fuel dollars pay for a complete Zonolite installation . . . now!

Why not talk to your lumber dealer today? He'll be glad to tell you all about it.

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